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Title: *Propagating Atmospheric Holes*

Cluster: *Cross-Theme Theory and Data Analysis/SECTP*

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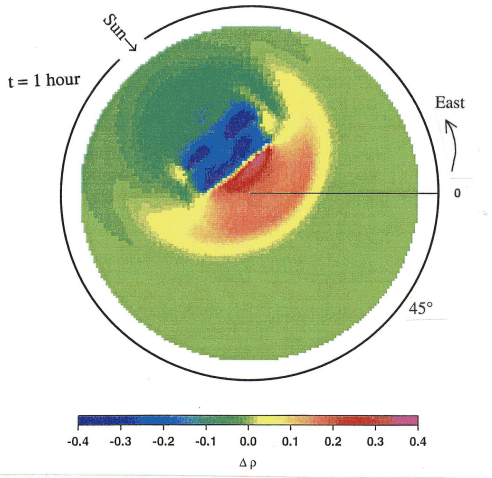
• Propagating Holes in the Earth's Upper Atmosphere

The Earth's lower atmosphere exhibits numerous small-scale weather features, such as thunderstorms and tornadoes. In contrast, it was generally believed that the Earth's upper atmosphere is more uniform and that solar storms produce only large-scale (global) perturbations in the neutral gas. However, simulations with a time-dependent, high-resolution, global model of the Earth's upper atmosphere indicate that propagating ionization patches (1000 km long, 200 km wide) act as snowplows, creating propagating holes in the upper atmosphere with density enhancements at the front of the holes. These and other small-scale neutral density structures are being studied with the new USU global model, which was developed with support from NASA's SEC Theory Program.

The result is directly relevant to NASA's Living with a Star Program and Space Weather applications. It predicts weather-scale upper atmosphere features due to ionospheric dynamics controlled by magnetospheric responses to changes in the interplanetary magnetic field.

Three propagating ionization patches observed over Greenland with an all-sky camera on October 29, 1989.

Perturbation in the upper atmospheric density at 300 km altitude induced by propagating ionization patches. Red corresponds to increases and blue to decreases relative to background densities. The geographic pole is at the center and the outer circle is 45° from the pole.



Ma, T.-Z., and Schunk, R. W., The Effects of Multiple Propagating Plasma Patches on the Polar Thermosphere, **J. Atmos. Solar-Terr. Phys**., in press, 2000.